

California High-Speed Train Project

Board of Directors

Project Implementation & Phasing Workshop

August 6th, 2009

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Chief Engineer

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California High-Speed Rail Authority

Introduction and Workshop Overview

- **Today's Workshop Objectives**
 - Discussion of Bringing Phase 1 to Revenue Service
 - First Step in developing a Program Plan
- **Format**
 - Presentation of steps to Revenue Service
 - Discussion, questions, comments, opinions

Presentation Agenda

Roles in Project Implementation

- Program Management Team, Regional Teams, Contractors & Suppliers

Current Program Status

- Outreach, Environment, Engineering

Next Steps to Revenue Service

- Staging, ROW, Procurement, Construction, Test & Commission

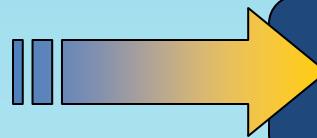
Initial Segment Example: Construction Staging

- Los Angeles - Anaheim

Summary & Objectives for Next Workshop

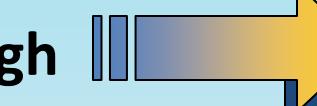
Implementation Team Roles

- Policy direction, outreach, finance, key decisions



Authority Board & Staff

- Management, technical standards, & direction through EIR/EIS & 30% design



Project Management Team (PB)

- Perform up to 30% design & environmental documentation for each section



Regional Teams

PHASE 1 Sections

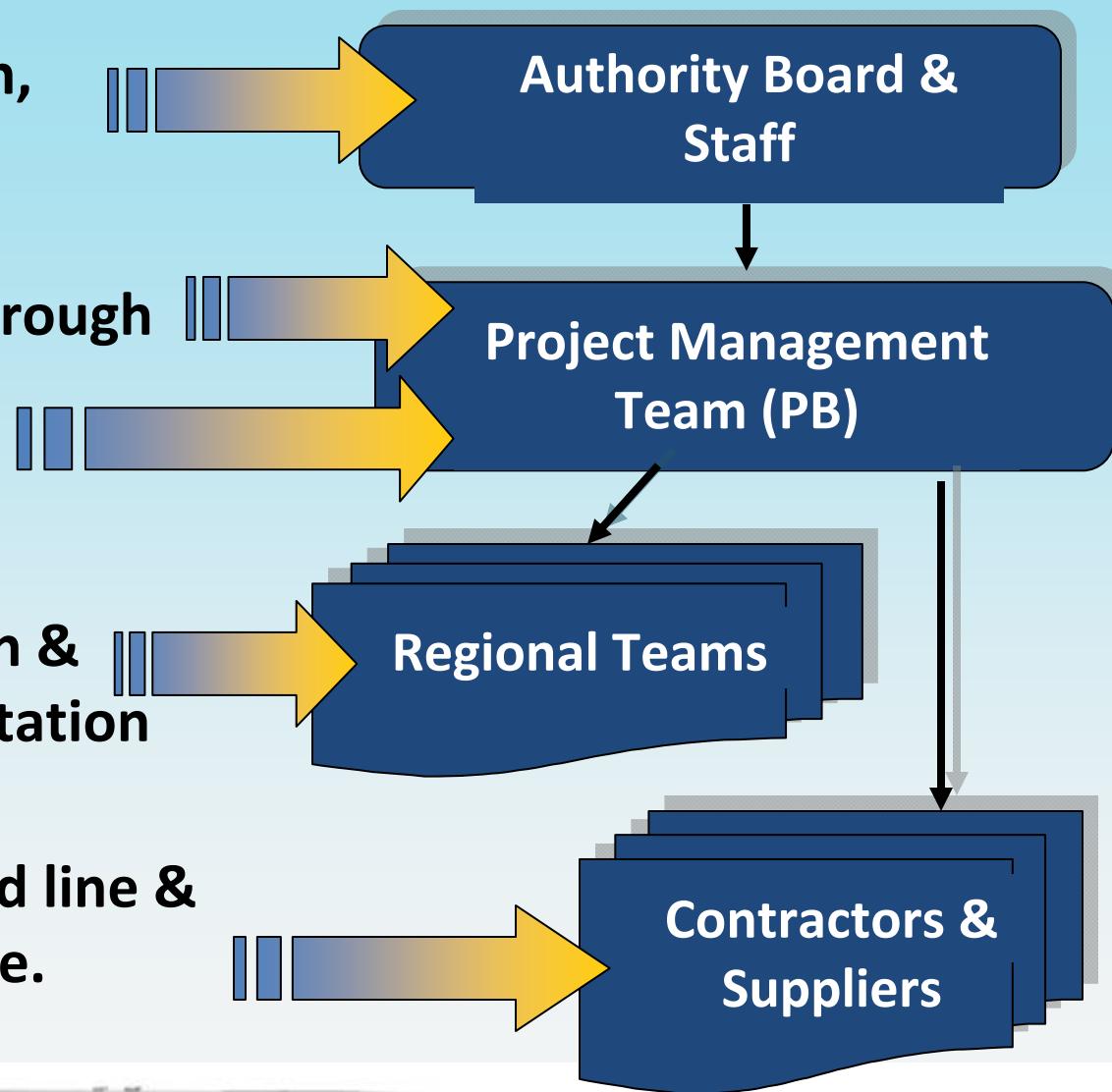


FULL SYSTEM Sections



Implementation Team Roles

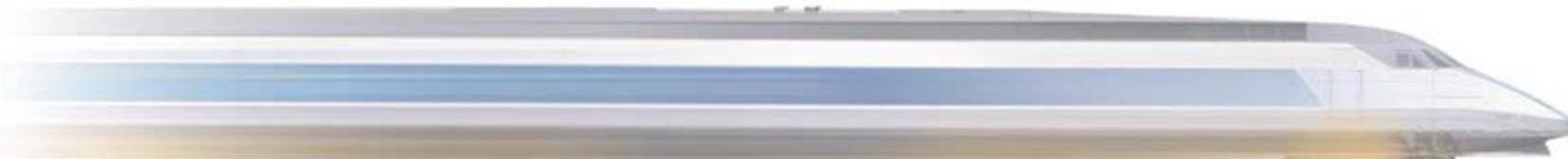
- Policy direction, outreach, finance, key decisions
- Management, technical standards, & direction through EIR/EIS & 30% design
- Manage construction & service start
- Perform up to 30% design & environmental documentation for each section
- Build & supply high-speed line & systems. Operate service.



Program Management Responsibilities

Parsons Brinckerhoff (PB)

- Outreach & Communications
- HSR Design Standards
- System Level Design
- Regulatory Approvals & Railroad Agreements
- Guidance for Environmental Approvals
- Manage Work of Regional Teams
- Manage Construction to Revenue Service



Program Management Responsibilities

- **Outreach & Communications**

- Advise on / implement Authority outreach strategy
- Develop and produce informational handout & video materials; establish and maintain website
- Oversee Regional Team environmental outreach to ensure consistent information state-wide
- Handle press, web, and public inquiries; foster feature articles and media pieces
- Assist in responding to queries from legislative, elected officials, and agencies
- Prepare studies, plans as needed

Program Management Responsibilities

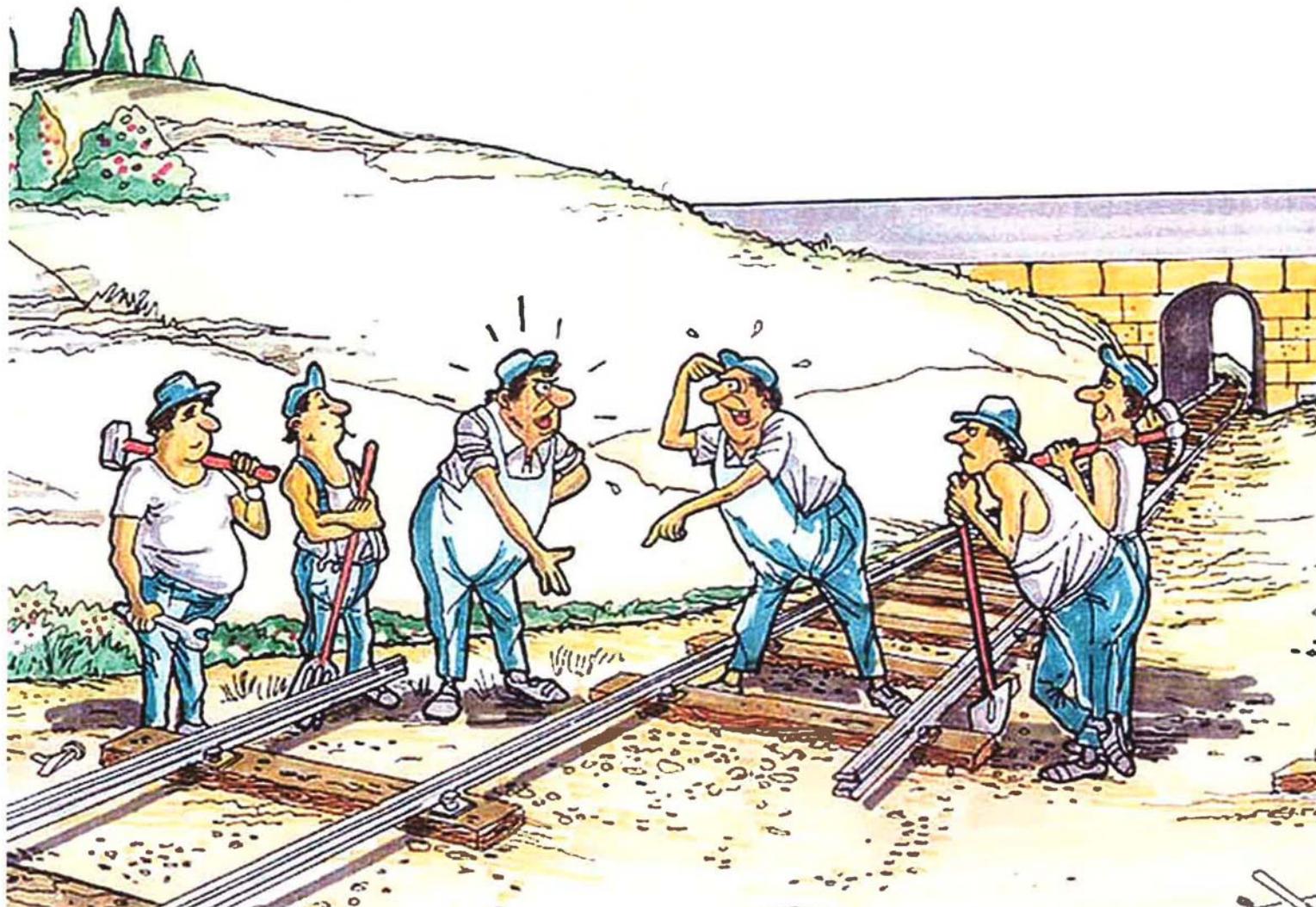
- **Develop HSR Design Standards**



- Ensure safety, reliability, & consistency throughout network
- Based on proven HSR systems worldwide
- Ensure system-wide integration of
 - Infrastructure
 - Rolling Stock
 - Train Controls
 - Electrification
 - Communications
 - Operations
 - Maintenance

Program Management Responsibilities

Team Work



Program Management Responsibilities

- **System Level Design**

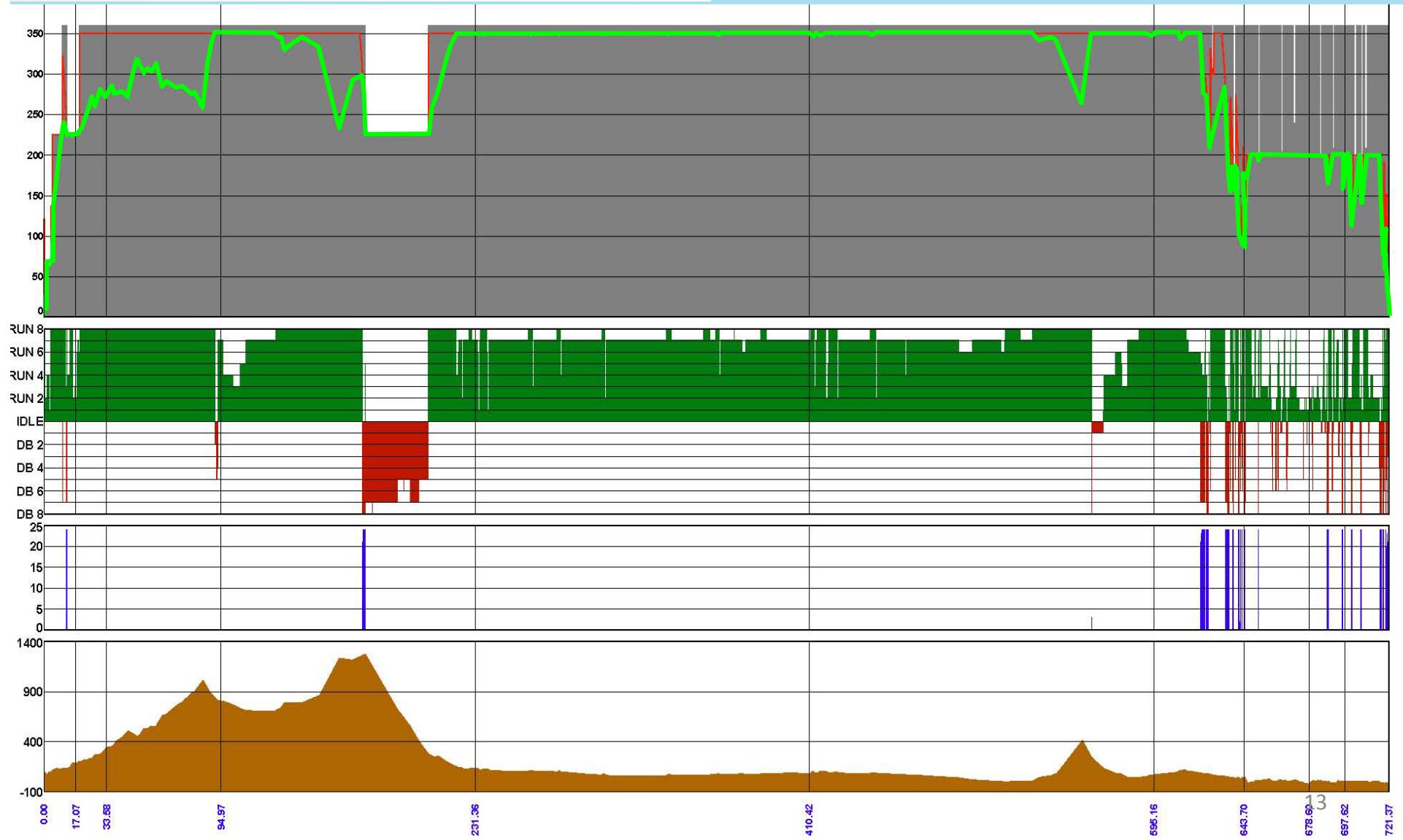
- **System Performance / Trip Time**
 - **Train Performance Characteristics**
 - **Alignment Profile**
 - **Station Location**



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Program Management Responsibilities

- System Level Design – System Performance/Trip Times



Program Management Responsibilities

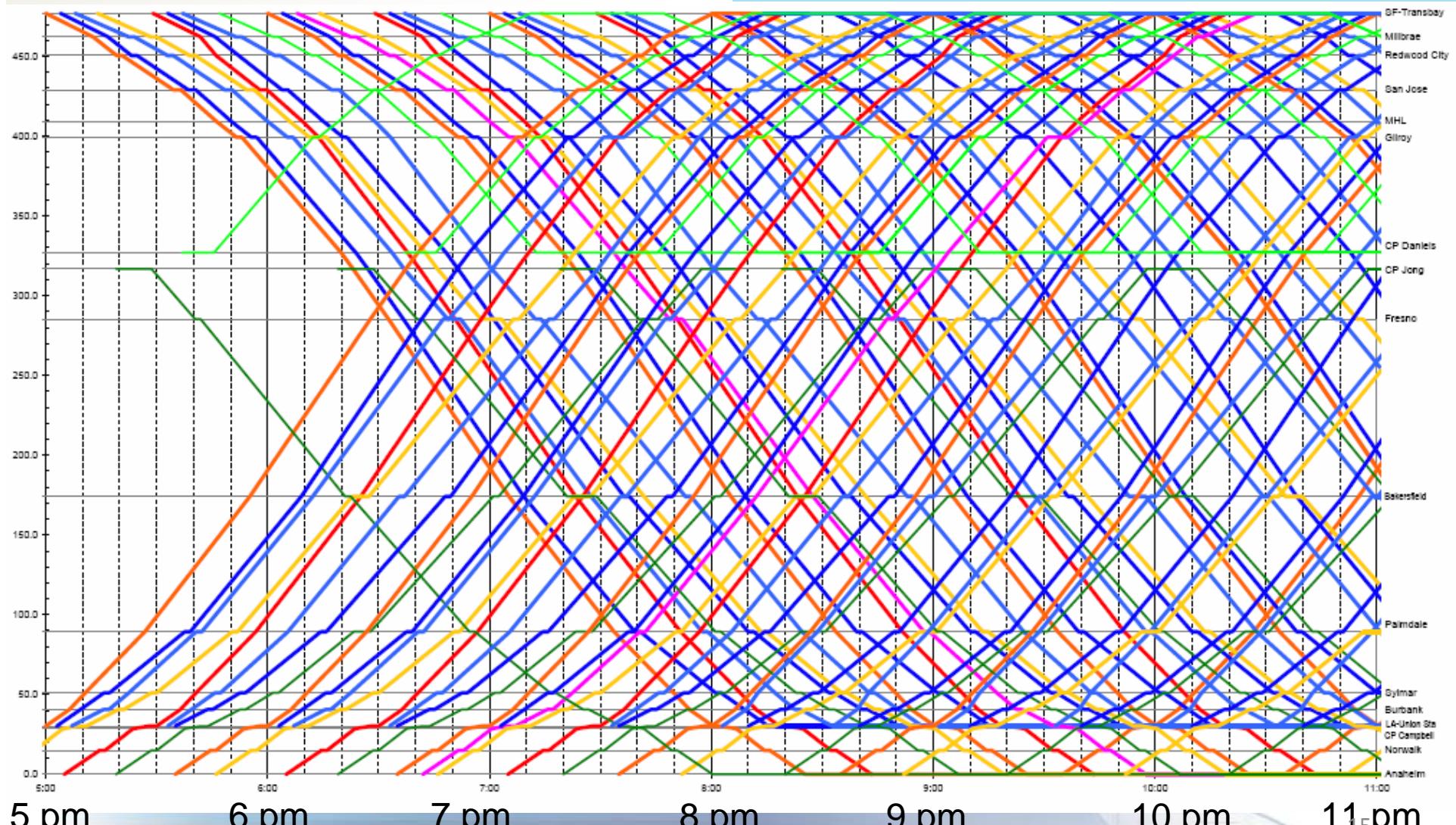
- System Level Design

- Draft Timetable / Operating Pattern

		Direction →	SB T18	SB T19	SB T22	SB T9	SB T20	SB T21	SB M1	SB T23	SB T24	SB T25
		Trainset →	S010700	S290703	S020730	S150708	S280708	S040711	S210733	S180737	S140752	S010800
		Train No. →										
Southbound		Pattern →	1	29	2	15	28	4	21	18	14	1
		Service Type →	Limited Express	Limited	Express	Merced All-Stop	Limited	All-Stop	Limited	Limited	Merced All-Stop	Limited Express
Station												
SFT	S.F.-Transbay	Dep	7:00	7:03	7:27		7:08	7:11	7:33	7:37	7:52	8:00
SFO	Millbrae	Dep	—	—			7:23	7:26	—	7:52	8:07	—
RWC	Redwood City	Dep	7:21	7:24			7:31	7:34	—	8:00	8:15	8:21
SJC	San Jose	Dep	7:35	7:38			7:45	7:48	8:05	8:14	8:29	8:35
GLY	Gilroy	Arr										
GLY	Gilroy	Dep	7:50	7:53			8:00	8:03	8:21	8:29	8:44	8:50
MCD	Merced	Dep.									9:19	
MCD	Merced	Dep				7:59						
FNO	Fresno	Arr						8:40				
FNO	Fresno	Dep				8:20	8:38	8:45		9:07		
BFD	Bakersfield	Arr				8:56						
BFD	Bakersfield	Dep				9:01	—	9:21	9:30	—		
PMD	Palmdale	Arr					9:40	9:52				
PMD	Palmdale	Dep		9:30		9:34	9:43	9:54	10:03	10:10		
SYL	Sylmar	Arr.				9:50	—	10:10	10:18	—		
SYL	Sylmar	Dep		9:46								
BUR	Burbank	Arr				9:56						
BUR	Burbank	Dep		—		9:59	—	10:17	10:25	10:29		
LAU	L.A. Union Station	Arr	9:47	9:58	10:05	10:08	10:10	10:26	10:34	10:38		10:47
LAU	L.A. Union Station	Dep	9:48	10:00	10:06	10:09	10:11	10:27	10:35	10:39		10:48
NSF	Norwalk	Arr	9:55		10:13	10:16	10:20	10:34				10:55
ANA	Anaheim	Arr	10:10		10:28	10:32	10:35	10:49				11:10

Program Management Responsibilities

- System Level Design – Operations Plan



Program Management Responsibilities

- **System Level Design**



- **Ridership Forecasts**
 - test alternative timetables / operations
 - alternative station sites
 - sensitivity to different fares & auto/air costs
 - **2030 & 2035, Phase 1, Full System**
 - Establish daily peak load factors & station boardings

Program Management Responsibilities

- **System Level Design**



- Trainset Technology / Number of Trainsets

Program Management Responsibilities

- **System Level Design**

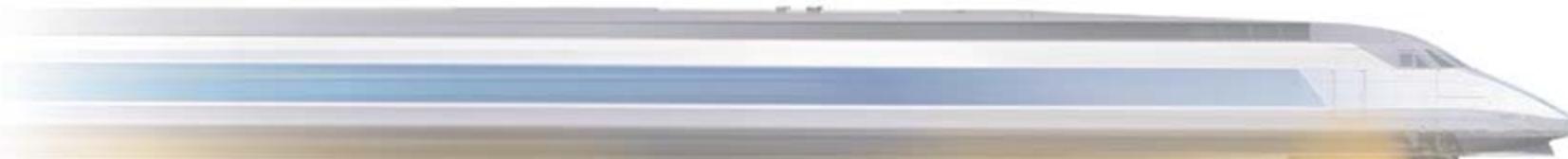


- Electrification / Traction Power
 - high voltage utilities transmission lines
 - traction power supply stations
 - switching/paralleling stations
 - overhead contact systems (OCS)

Program Management Responsibilities

- **System Level Design**

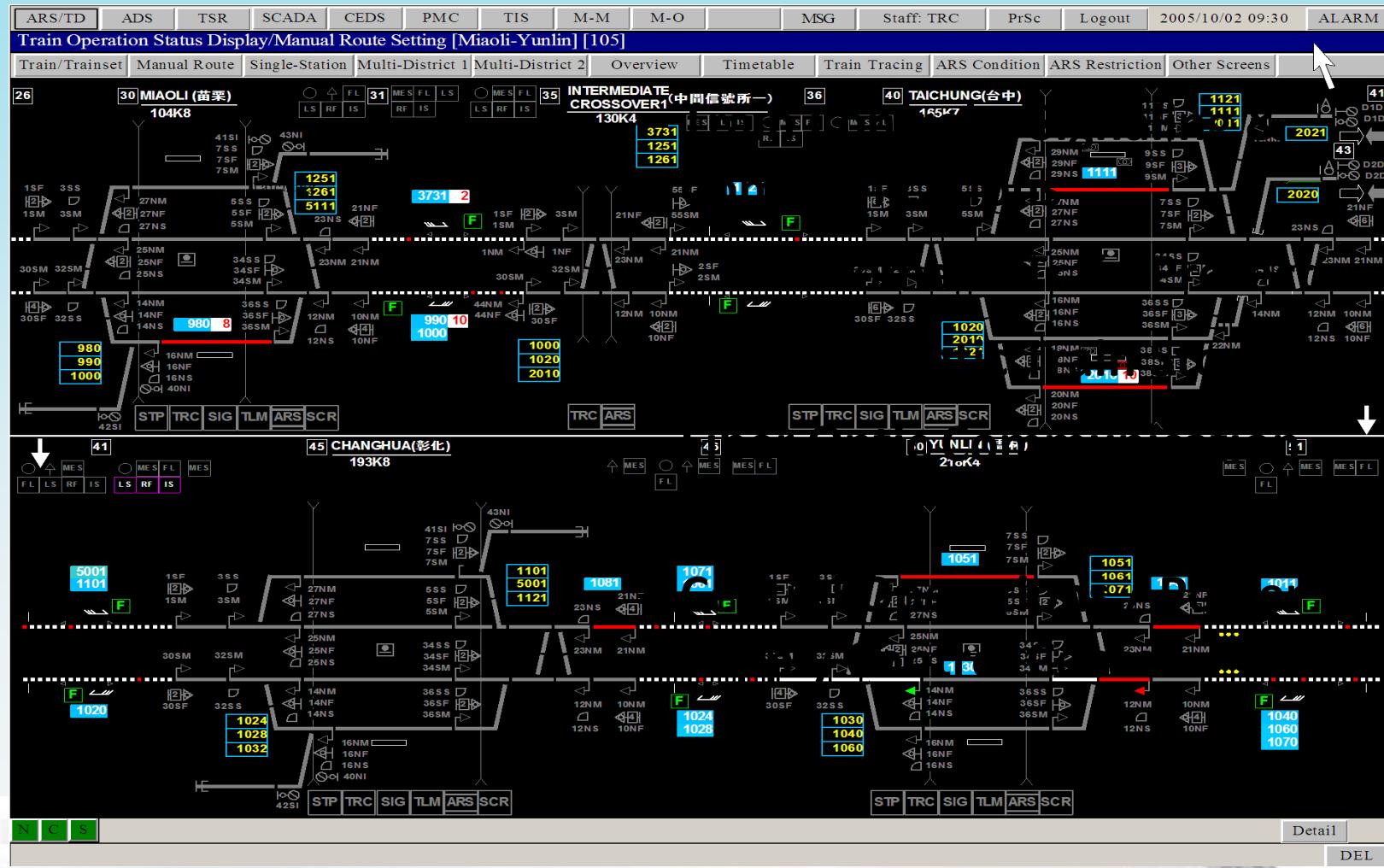
- Train Control – Signalling & Communications
 - Automatic Train Protection
 - Automatic Train Stop
- Fiber Optic Communication system
- Central Operations / Power Supply Control Center



Program Management Responsibilities

- System Level Design

Train Control – Signaling & Communications



Program Management Responsibilities

- **System Level Design**



- Maintenance Plan
 - Trainsets
 - Track Equipment
 - Train Controls / Signalling
 - Overhead Contact System
 - Power Supply
 - Stations
 - Civil structures

Program Management Responsibilities

- Regulatory Approvals & Railroad Agreements



- Federal Railroad Administration
 - Existing - *Code of Federal Regulations*
 - Needed - *Rule of Particular Applicability* as no rule exists for >150 mph
- CA Public Utility Commission
 - *General Orders* to allow 25kV OCS equipment to operate in California
- Caltrans
- Railroad Owners and Operators
 - BNSF*
 - Caltrain (PCJPB)*
 - ACE (CCJPA)*
 - UPRR*
 - Metrolink (OCTA, LACTA)*
 - Amtrak*
 - Coaster (NCTD, SANDAG)*

Program Management Responsibilities

- Environmental Approval Guidance



- Develop agreed standard methodologies for required EIR/EIS subject areas
- Develop agreed consultation procedures & documentation for all Regional Teams to use
- Review all Regional Team EIR/EIS materials for consistency & reasonableness
- Negotiate statewide agreements, e.g. US Army Corps of Engineers, Fish & Wildlife, State Historic Preservation Office
- Expedite ROD / NOD – *Essential for construction start*

Program Management Responsibilities

- **Manage the Work of the Regional Teams**



- Drive schedule, control budget, ensure quality
- Resource agency coordination
- Ensure consistent:
 - environmental documents
 - public outreach / communications
 - design & system integration
- Ensure design submittals meet HSR standards & criteria



Program Management Responsibilities

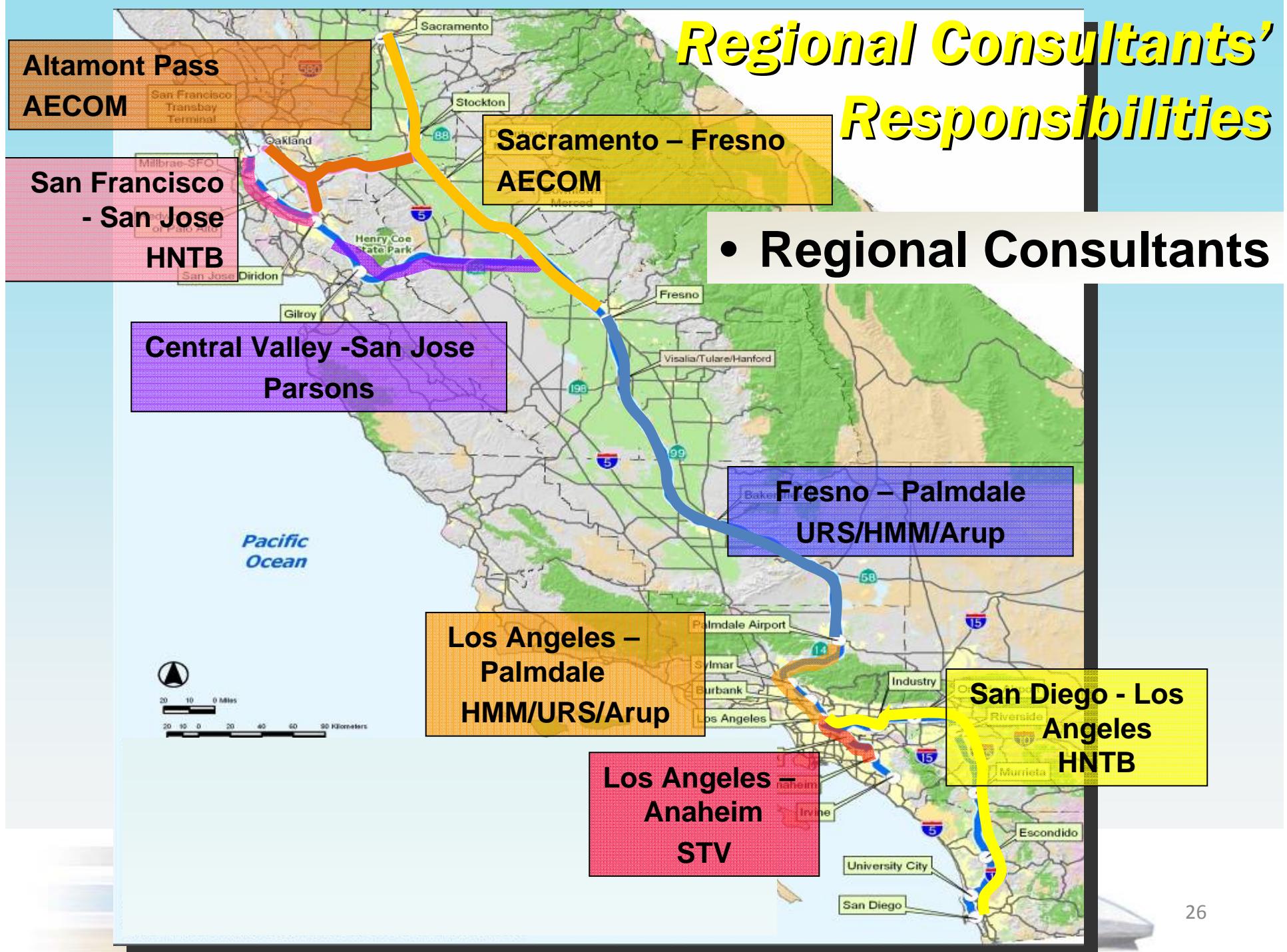
- **Manage Construction to Revenue Service**



- Oversee ROW acquisition/permitting
- Manage bid / procurement process
- Drive schedule, control budget, ensure construction meets HSR quality standards
- Drive testing and commissioning of line, trains, and systems
- Ensure finished system is safe, reliable, & ready for revenue service

Regional Consultants' Responsibilities

- Regional Consultants



Regional Consultants' Responsibilities

- **Engineering & Environmental Clearance**

- Production of project-level EIR / EIS
 - scoping, outreach, baseline studies, impacts of project, mitigations, final documents to ROD/NOD
- Based on HSR standards & criteria set by the PM Team
 - prepare site-specific 15% engineering to support environmental work and finalize alignments
 - prepare site specific 30% engineering to support bid documents
 - Complete camera-ready drawings & specifications for Bid Documents

Current Program Status

- Outreach and Communications
- System Level Design
- Infrastructure Engineering Design
- Regulatory & RR Issues
- Environmental Guidance
- EIR/EIS & 15% Design Schedule
- Schedule to Phase 1 Revenue Service

Current Program Status

- **Outreach and Communications**

- Monumental shift in California's understanding of importance of high-speed train system as shown by passage of Prop 1A
- Communications oversight and collaboration of project-level EIR/S public and agency participation activity
- Statewide public engagement
 - ~ 400 stakeholder meetings in FY 08-09
 - Millions of news media impressions each month
 - International, national and regional news media features
 - Improved and maintained Authority website
 - Over 100 visual simulations
 - Presentations and speaking engagements
- Business plan and regional economic impact studies

Current Program Status

- **System Level Design – Operations / Ridership**
 - Established for Phase 1 & Full System
 - Detailed timetable
 - 2035 ridership & revenue forecast
 - Passenger boardings for all stations
 - Daily & hourly riders for all stations and segments
 - Peak capacity of trainset 450-500
 - Peak period traffic requires coupling two trainsets together to provide 900 – 1,000 seats per train



Current Program Status

- **System Level Design – Vehicles (Trainsets)**

- **Performance requirements**
 - Meet Federal / Technical Specifications for Interoperability (TSI) standards
 - Capacity up to 500 passengers
 - Maximum length: 652 feet single trainset (200m)
 - Speed 220 mph
 - Capable of coupling two sets together
 - Using Positive Train Control



Current Program Status

- **System Level Design – Vehicles (Trainsets)**

- Under Current Review
 - Draft trainset numbers for Phase 1 & Full System
 - Single or double-deck trainsets
 - Development of trainset specifications
 - Anticipated manufacturing production schedule



Current Program Status

- **System Level Design – Maintenance Facilities**

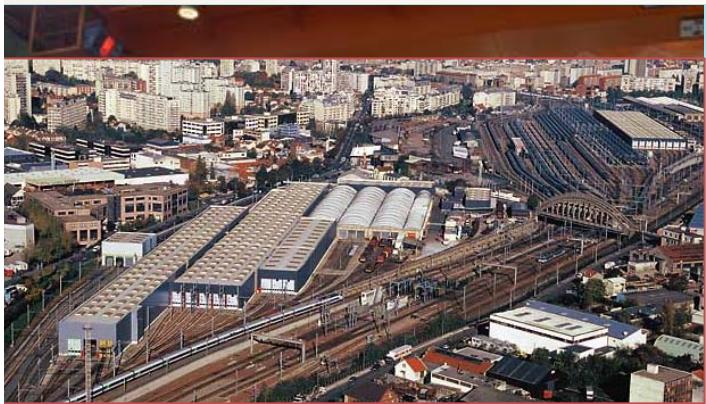


- Established vehicle maintenance facility needs based on European and Asian preventive maintenance
- Issued Technical Memos & drawings for the 3 shops needed in Phase 1:
 - one heavy overhaul facility
 - two periodic maintenance facilities with layup/storage facilities
 - other infrastructure and systems maintenance facilities



Current Program Status

- **System Level Design – Maintenance Facilities**

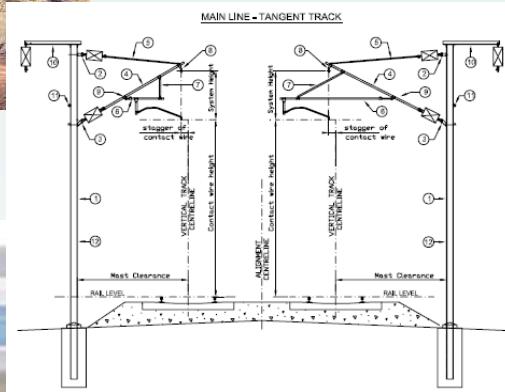


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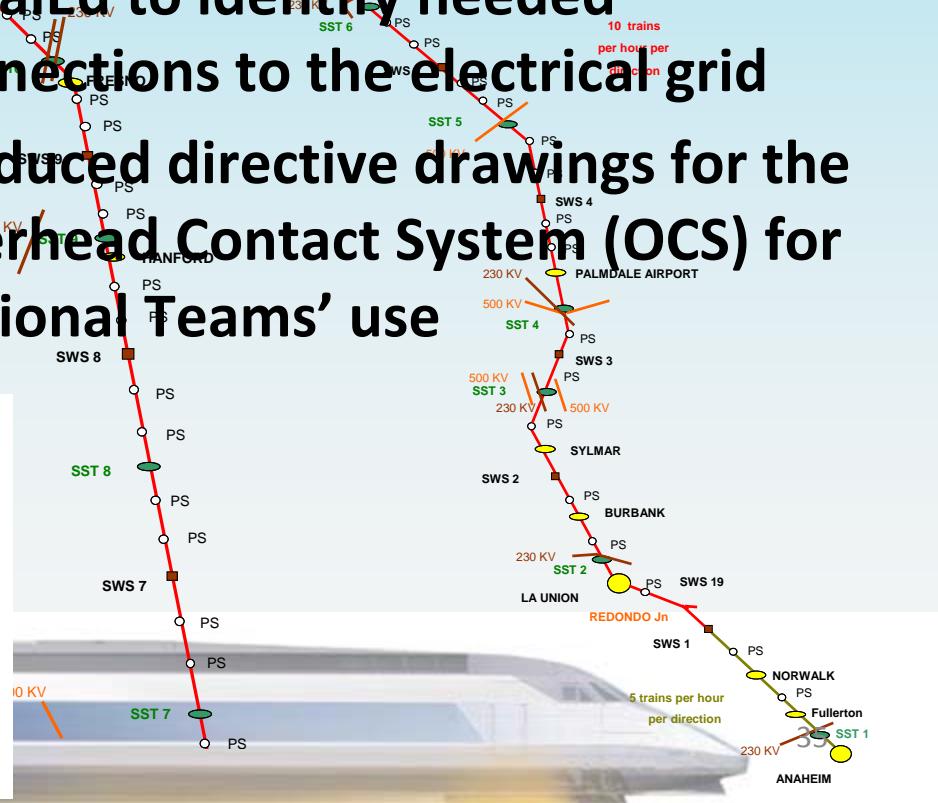


Current Program Status

• System Level Design – Electrification



- Established size & location of power supply sub-stations for Phase 1
- Working with PUC, PG&E, and SoCalEd to identify needed connections to the electrical grid
- Produced directive drawings for the Overhead Contact System (OCS) for Regional Teams' use



Current Program Status

- **System Level Design – Controls**

- Preparing performance specification for Positive Train Control System
 - Automatic Train Protection
 - Automatic Train Control
 - Automatic Train Supervision
- Positive Train Control prevents
 - train to train collisions
 - overspeed derailments
- PTC controls train operations in abnormal conditions



Current Program Status

- **Infrastructure Engineering Design**

- Criteria developed to let 15% design to proceed unimpeded
- **21 Technical Memoranda covering:**
 - Typical cross-sections for 220 mph operation
 - Alignment design (curvature / grade)
 - Aerial structure & tunnel design
 - Track turnouts & station track layout
 - Station site & design guidelines /requirements
 - Geotechnical and seismic design
 - Utility relocation, design life, & other issues



Current Program Status

- **Infrastructure Engineering Design**

- Input from Japanese and European HST engineers to confirm approach to design and operations planning
- Established review processes to resolve Regional Team design issues & ensure criteria are met
- Developed initial list of Standard Drawings & Specifications required for procurement
- Provided CHSTP requirements & technical documentation to TJPA Transbay Terminal designers to maximize compatibility
- Began preparing more detailed 30% design Tech Memos



Current Program Status

- **Regulatory & Railroad Work**

- Working with the FRA on Rule of Particular Applicability (RPA) to cover alignment design, operation, trainset requirements for operations at 220 mph
- European Technical Specifications for Interoperability (TSI) being used with FRA as starting point to develop RPA & CA design criteria
 - formal body of standards for up to 220 mph
 - used by Asian and European manufacturers
- Formal Verification & Validation process for CA being based on EN 50126 1-1999 to ensure Reliability, Availability, Maintainability, & Safety (RAMS) requirements are met

Current Program Status

- **Regulatory & Railroad Work**

- No current regulations in California for using power at 25 kV AC; working with California Public Utilities Commission (CPUC) on new rules
 - General Order 26D on clearances on railroads
 - General Order 95 on overhead line construction
 - service connections to the statewide power grid (together with California Energy Commission)
- Discussions active with passenger and freight rail operators & owners

Current Program Status

- **Environmental Guidance**

- Developed standardized process for all EIR/S sections, approved by Authority, FRA, & CA AG's office
 - Alternatives analysis and technical methodologies
 - Guidelines for record keeping, scoping, document formats, agency coordination, multi-lingual conduct of business
- Defined process for determining independent utility and logical termini of HST sections
- Prepared various policies & impact criteria currently in draft form, e.g. on parking at stations, vehicle & pedestrian traffic, noise effects on wildlife

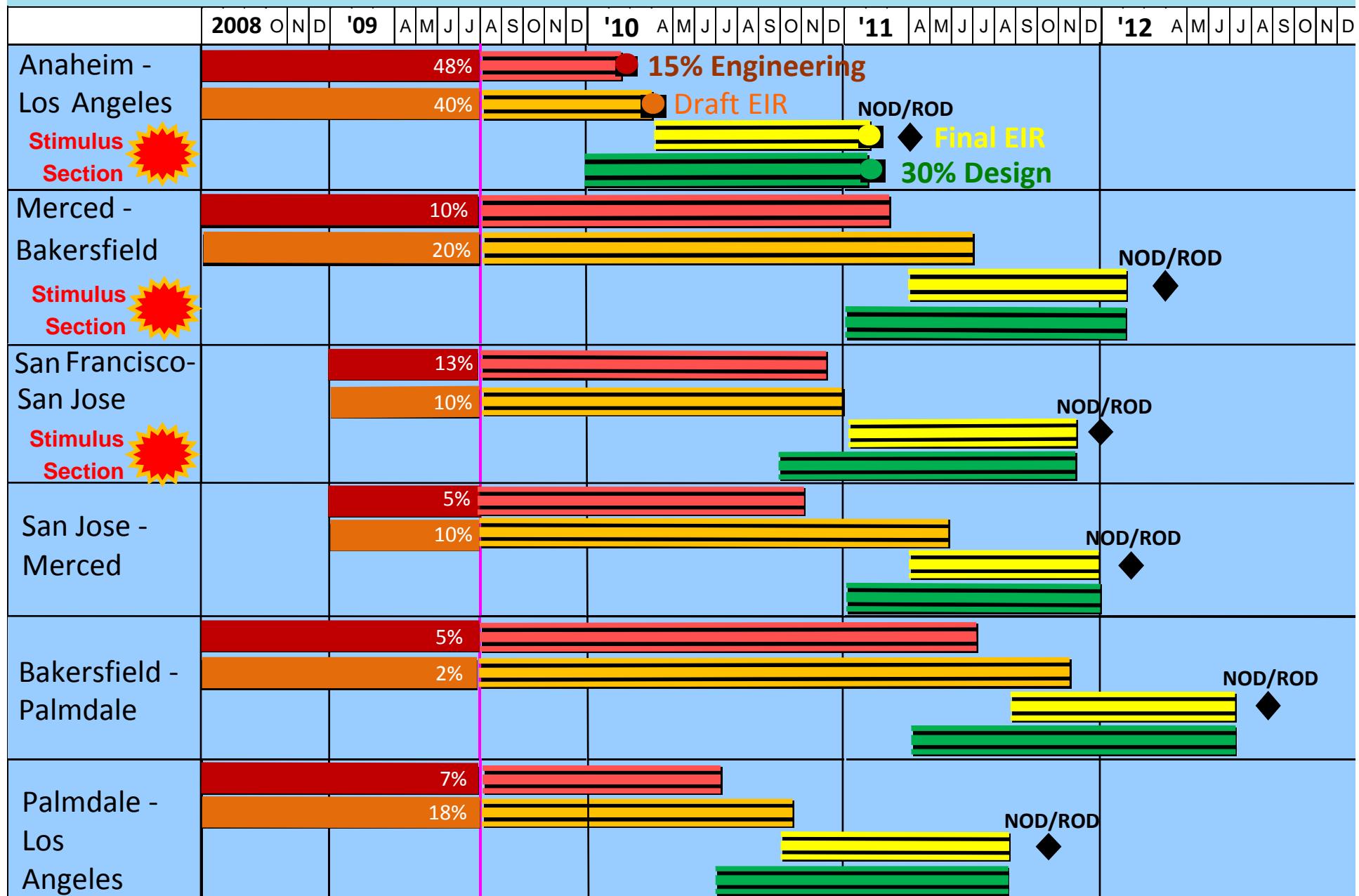
Current Program Status

- **Master Schedule**

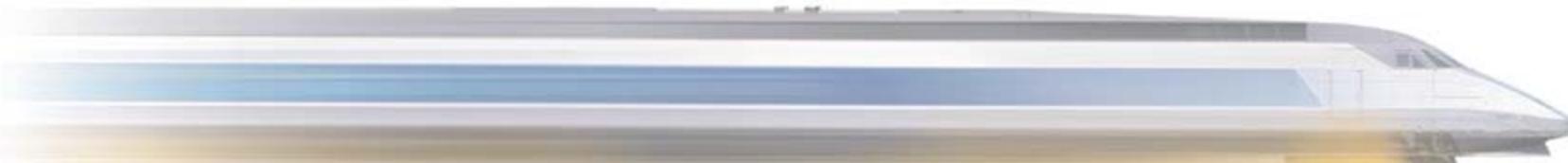
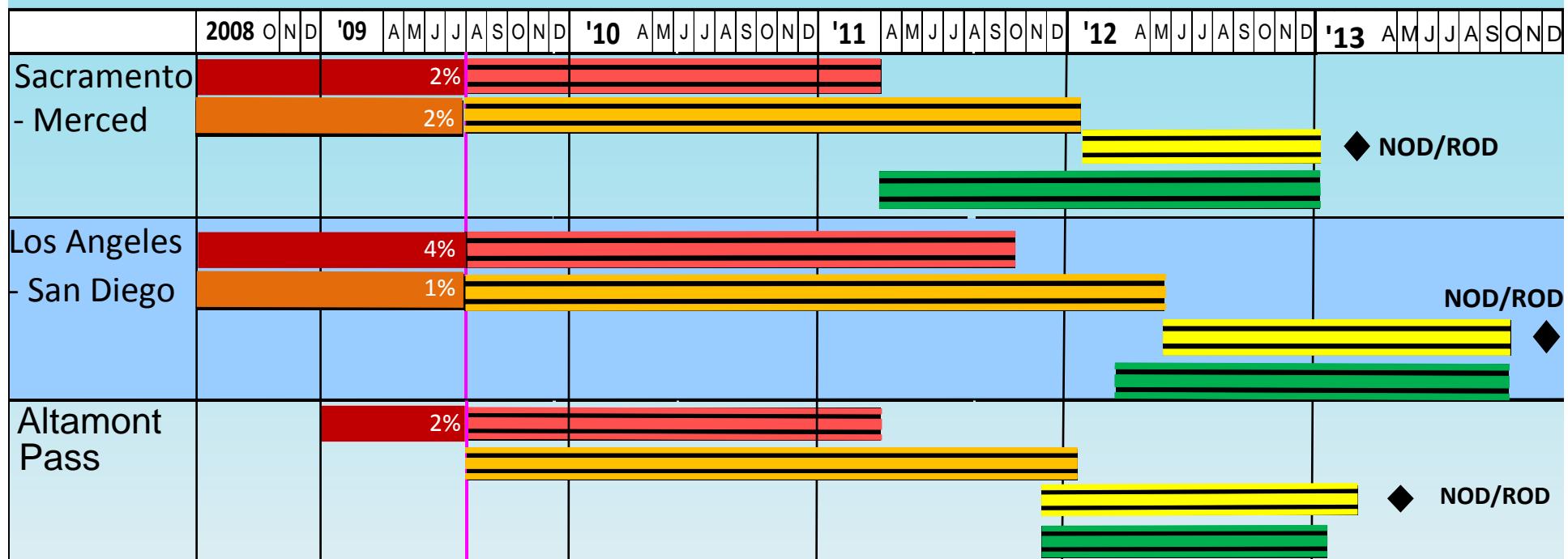
- Established master baseline schedule for ROD/NOD for each section



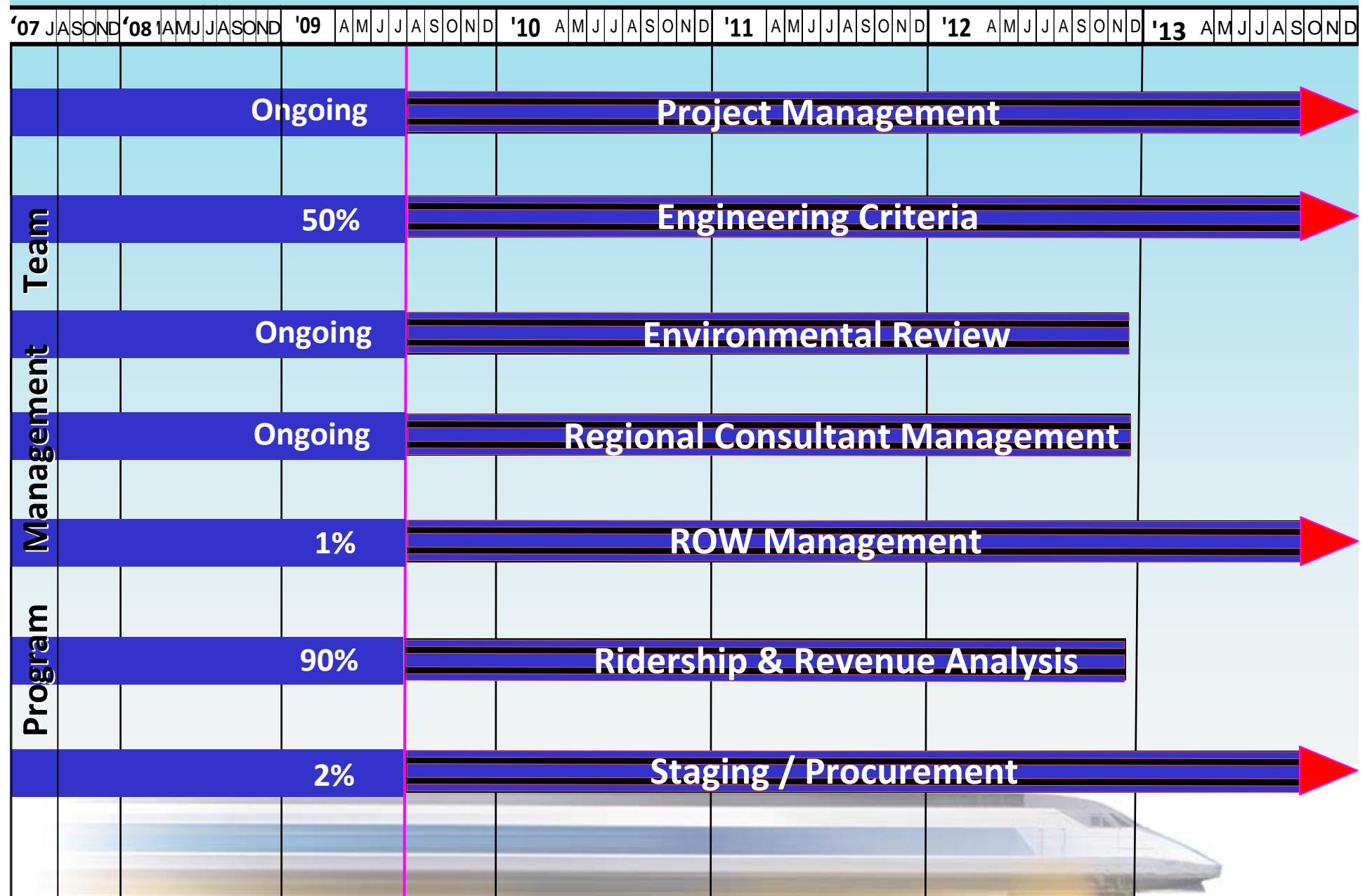
Phase 1 Regional Teams' Progress / Plan



Following Phase Regional Teams' Progress / Plan



Program Management Teams' Progress / Plan



Current Program Status

	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	
	D	M	J	S	D	M	J	S	D	M	J	S	D	M
Los Angeles to Anaheim - STV														
Environmental Process (EIR/EIS)														
NOD / ROD Issued														
ROW Preservation / Acquisition														
Request for Exp of Interest (RFEI)														
Request for Qualifications (RFQ)														
Industry Review														
Bid Period														
Design / Build Contract														
Test / Accept / Pre-Rev.Ops.														
Los Angeles to Palmdale - HMM														
Environmental Process (EIR/EIS)														
NOD / ROD Issued														
ROW Preservation / Acquisition														
Request for Exp of Interest (RFEI)														
Request for Qualifications (RFQ)														
Industry Review														
Bid Period														
Design / Build Contract														
Test / Accept / Pre-Rev.Ops.														

Current Program Status

	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	
	D	M	J	S	D	M	J	S	D	M	J	S	D	M
Palmdale to Bakersfield- URS														
Environmental Process (EIR/EIS)														
NOD / ROD Issued														
ROW Preservation / Acquisition														
Request for Exp of Interest (RFEI)														
Request for Qualifications (RFQ)														
Industry Review														
Bid Period														
Design / Build Contract														
Test / Accept / Pre-Rev.Ops.														
Bakersfield to Merced - URS														
Environmental Process (EIR/EIS)														
NOD / ROD Issued														
ROW Preservation / Acquisition														
Request for Exp of Interest (RFEI)														
Request for Qualifications (RFQ)														
Industry Review														
Bid Period														
Design / Build Contract														
Test / Accept / Pre-Rev.Ops.														

Current Program Status

Merced to San Jose - Parsons

- Environmental Process (EIR/EIS)
- NOD / ROD Issued
- ROW Preservation / Acquisition
- Request for Exp of Interest (RFEI)
- Request for Qualifications (RFQ)
- Industry Review
- Bid Period
- Design / Build Contract
- Test / Accept / Pre-Rev.Ops.

San Jose to San Francisco-HNTB

- Environmental Process (EIR/EIS)
- NOD / ROD Issued
- ROW Preservation / Acquisition
- Request for Exp of Interest (RFEI)
- Request for Qualifications (RFQ)
- Industry Review
- Bid Period
- Design / Build Contract
- Test / Accept / Pre-Rev.Ops.

Revenue Service

Construction

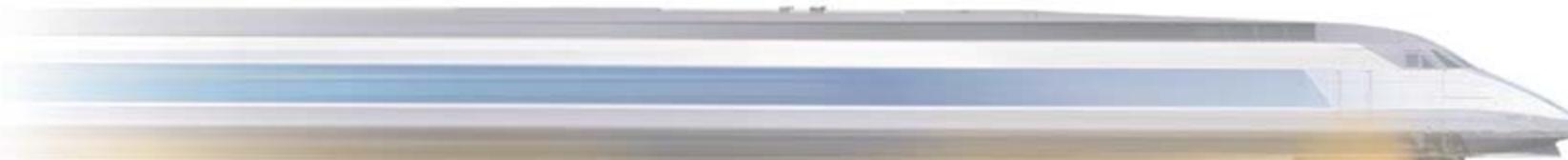
Testing

ROD/NOD

Current Program Status

	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	
	D	M	J	S	D	M	J	S	D	M	J	S	D	M	J	S
Sacramento to Merced - AECOM																
Environmental Process (EIR/EIS)																
NOD / ROD Issued																
ROW Preservation / Acquisition																
Request for Exp of Interest (RFEI)																
Request for Qualifications (RFQ)																
Industry Review																
Bid Period																
Design / Build Contract																
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Los Angeles to San Diego - HNTB																
Environmental Process (EIR/EIS)																
NOD / ROD Issued																
ROW Preservation / Acquisition																
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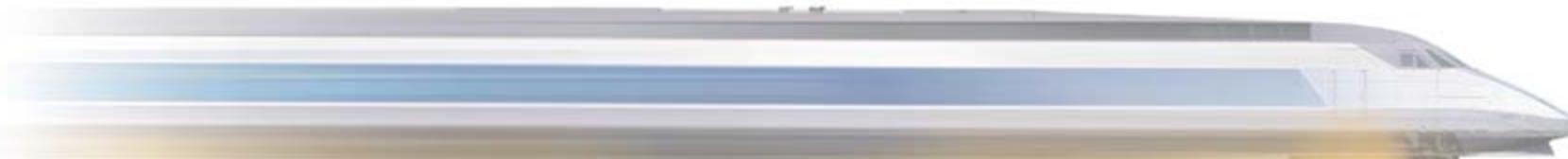
Current Program Status



Current Program Status

- **Master Schedule**

- Established master baseline schedule for ROD/NOD for each section
- Developed a schedule to completion of work & opening of revenue service
- All work to date within budget targets
- Slow ramp-up due to stop/go budgets
- Now can climb to meet schedule as the budget more predictable



Next Steps to Revenue Service

- Overall Concept – Test Track & Rail Extensions
- 30% Design
- ROW Acquisition / Permitting
- Delivery Contracts
- Approach to Staging Work
- Testing, Commissioning & Revenue Service
- Management of Construction / Installation
- Example: Los Angeles - Anaheim



Next Steps to Revenue Service

• Overall Concept – Test Track & Rail Extensions

- Test track section needed
 - to demonstrate at all speeds that line meets FRA, CPUC regulatory requirements
 - to validate that all elements meet Authority RAMS requirements
- Needs train maintenance and central control facilities
- Proximity of ROD/NOD dates of other sections gives flexibility to expand as completed



Steps to Revenue Service

- **30% Design and other critical items**
 - Complete 30% Design and Specifications while Draft EIR/EIS is being reviewed and finalized for ROD/NOD
 - Prepare camera-ready documents for bid solicitation on ROD/NOD dates
 - Have regulatory approvals in place with the FRA and PUC
 - Complete all necessary documents with all the regulatory agencies and railroads

Steps to Revenue Service

- **Right-of-way acquisition / Permitting**

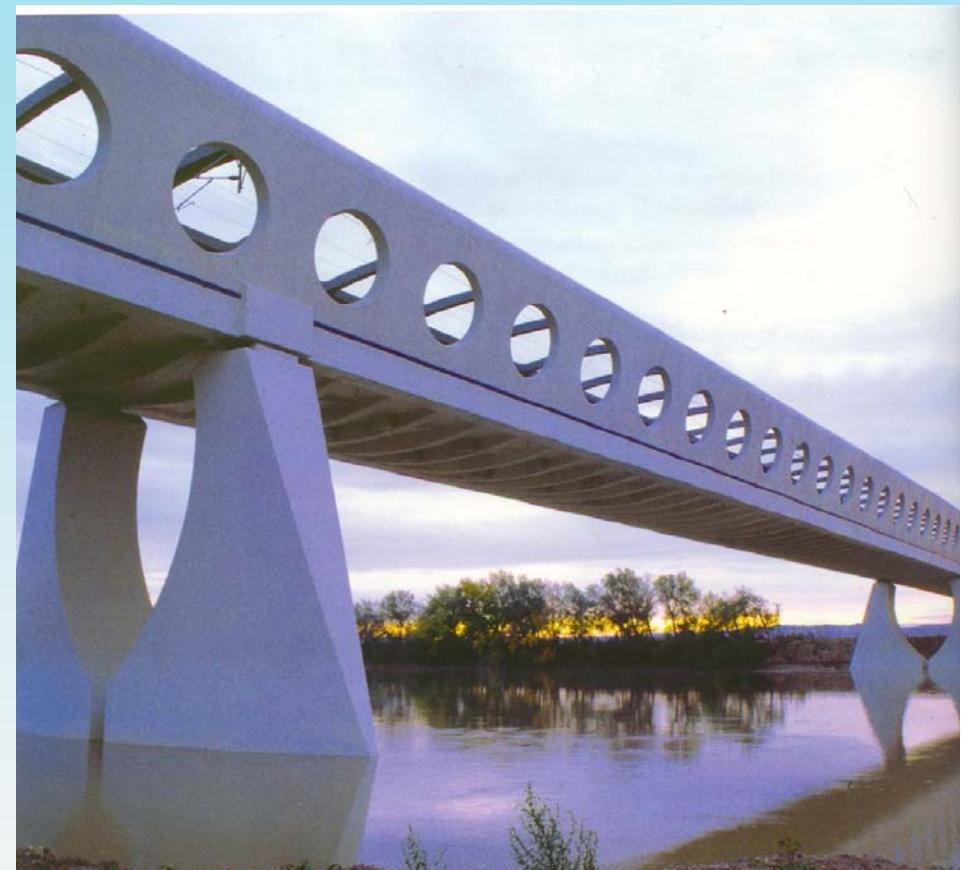
- Use existing expertise & resources of CA Dept. of General Services & Caltrans
- Prior to ROD/NOD:
 - Identify & survey possible parcels
 - Legal descriptions, title searches
- Only after ROD/NOD:
 - Appraisals & offers to purchase
 - Relocation assistance & planning
 - Takings, if needed
 - Disposition of excess property
- Environmental permits & approvals



Delivery Contracts

- **Design-Build / Public-Private Partnership (P3)**

- Alternative project delivery
- Single entity provides:
 - Final design
 - Construction services
- Potential for providing:
 - Private financing
 - Maintenance
 - Operation



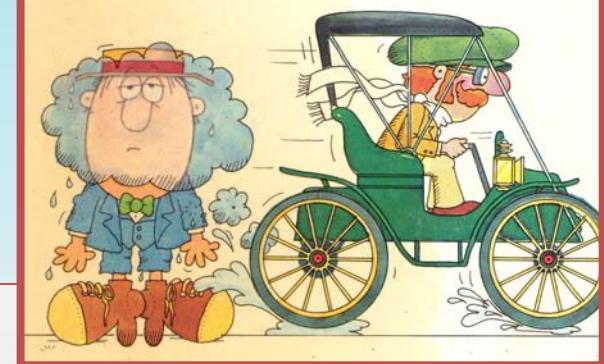
Delivery Contracts

- **Advantages of Design – Build / P3 Approach**

- Single point of responsibility
- Integrated Designer / Builder team
- Promotes Innovation
- Earlier delivery – fast track construction
- Potentially lower costs:
 - Initial — Life cycle
- Potentially lower public financing with P3
- Procurement flexibility
- Shared risk

Every great idea has a disadvantage equal to, or exceeding, the greatness of the idea!

MURPHY'S LAW NO. 9



Delivery Contracts

- **Structuring Contracts – Terms & Issues**

- Legal – compliance with legislation, Prop 1A terms, changes in law
- Commercial – changes, insurance requirements, dispute resolution, indemnification, liability cap, consequential damages, payment terms, warranties
- Technical – 30% design, specs & technical data, construction management, design reviews, shop drawings, submittals, testing, schedules, standards & criteria
- Community impacts – mitigate specific impacts to stakeholders – keep good community information flow (traffic control, road closures, dust control, utility outages)

Delivery Contracts

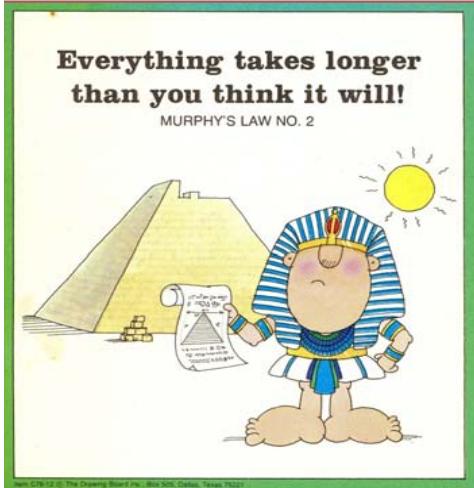
- **Structuring Contracts**

- Labor coordination & availability – union workshops, open dialogue well in advance
- Packaging – ensure competition, attract best qualified firms
- Bonding challenging
 - Parent company guarantees
 - Letters of credit
- Insurance (OCIP) – less cost if State wraps project insurance



Delivery Contracts

- **Process leading to contract**



- Request For Expressions of Interest – opens dialogue with industry for understanding requirements and indicating industry interest
- Workshop – continues dialogue – describes procurement process - clarifies issues – gets input
- Issue RFQ – solicits qualitative responses by potential bidders
- Determine pre-qualified firms – narrow the field to those who could potentially win
- Industry review of draft documents – engage pre-qualified firms to improve documents

By making something perfectly clear, someone will be totally confused!

MURPHY'S LAW NO. 8



Delivery Contracts

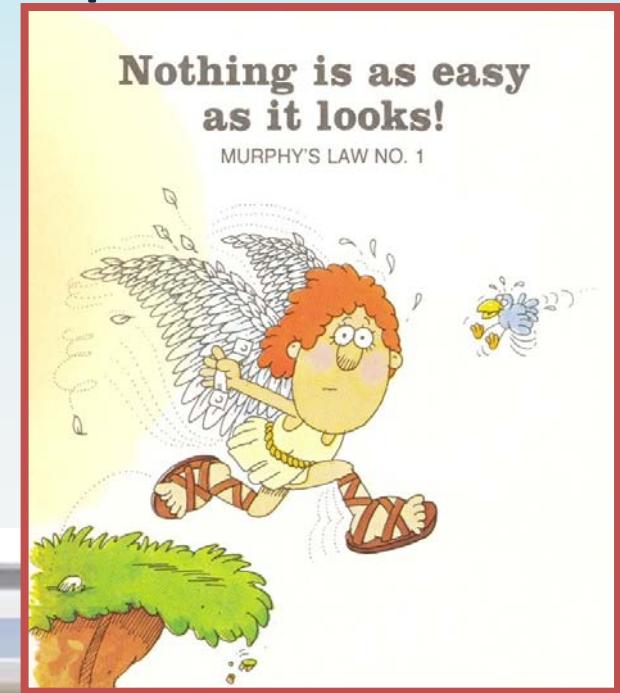
- **Process leading to contract**

- Issue RFP to pre-qualified firms - technical, management, commercial, finance, legal
- Pre-proposal meeting
 - Convey project intent, partnering philosophy, proposal requirements, selection process, selection criteria
 - Clarifications, site visits, pro forma contract, document availability, schedule, submitting questions
- Receive and evaluate proposals – professional panel

Delivery Contracts

- **Process leading to contract**

- Select short list of preferred firms - best-qualified - panel of professionals
- Conduct oral interviews
- Select best value D-B/P3 contractor and negotiate – terms & conditions, innovative scope changes, final price - professional panel
- Reconfirm financing in place
- Board approval for contract award
- Award contract
- Issue Notice to Proceed to contractor



Next Steps to Revenue Service

■ Approach to Staging Work

- Complete the test track**
 - core systems**
 - operator & maintenance**
 - infrastructure elements**
 - core system delivery options**
 - integration of core systems & infrastructure**
 - testing & commissioning/revenue service**
- After completing, link the test track with other sections**

Next Steps to Revenue Service

- **Core System Elements**

- **Trainsets**
- **Train Control – Signaling**
- **Communications**
- **Central Control Center**
 - operations & power supply
- **Electrification / Traction Power**
 - traction power supply stations
 - switching/paralleling stations
 - overhead contact systems (OCS)
- **Track, ties/ballast, fastening system**
- **Maintenance equipment for trains & systems**



Next Steps to Revenue Service

- **Importance of Integrated Core System**

- Concept of using a single contract team
- Safety / reliability depends on the critical integration of the core system elements
- Single responsibility for overall design, installing, and testing & commissioning, and maintaining
 - maximizes safety and reliability
 - reduces life cycle costs
 - provides clear lines of responsibility for critical operations
 - specialized personnel who install are available to maintain as part of core system maintenance contract

Next Steps to Revenue Service

- **Operator & maintenance responsibilities**

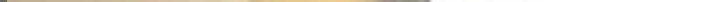
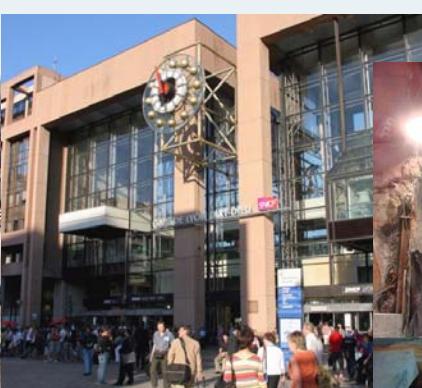
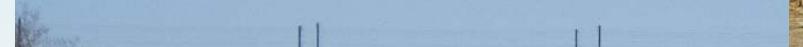


- **Operations tasks include:**
 - service planning & fare setting
 - operations planning, scheduling, fares
 - train driving & dispatching
 - on-board passenger services
 - ticketing & revenue accounting
 - station services & security
- **Maintenance tasks include**
 - train servicing & inspection
 - train maintenance
 - fixed core system & infrastructure inspection & maintenance

Next Steps to Revenue Service

• Infrastructure Elements

- Site clearing
- Utility relocation
- Street improvements / mitigations
- Grade separations
- Grading & earthworks
- Aerial structures
- Tunnels
- Stations & ancillary buildings
- Maintenance facilities infrastructure



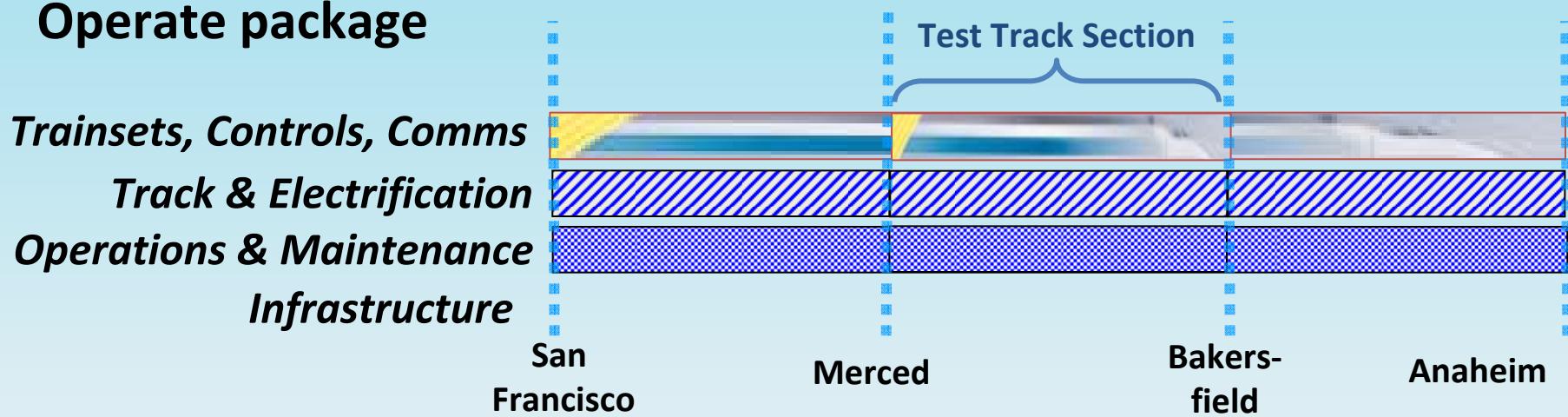
Next Steps to Revenue Service



Steps to Revenue Service

- System Delivery Options

Option 1 - Single Core System Design / Build / Maintain / Finance/ Operate package

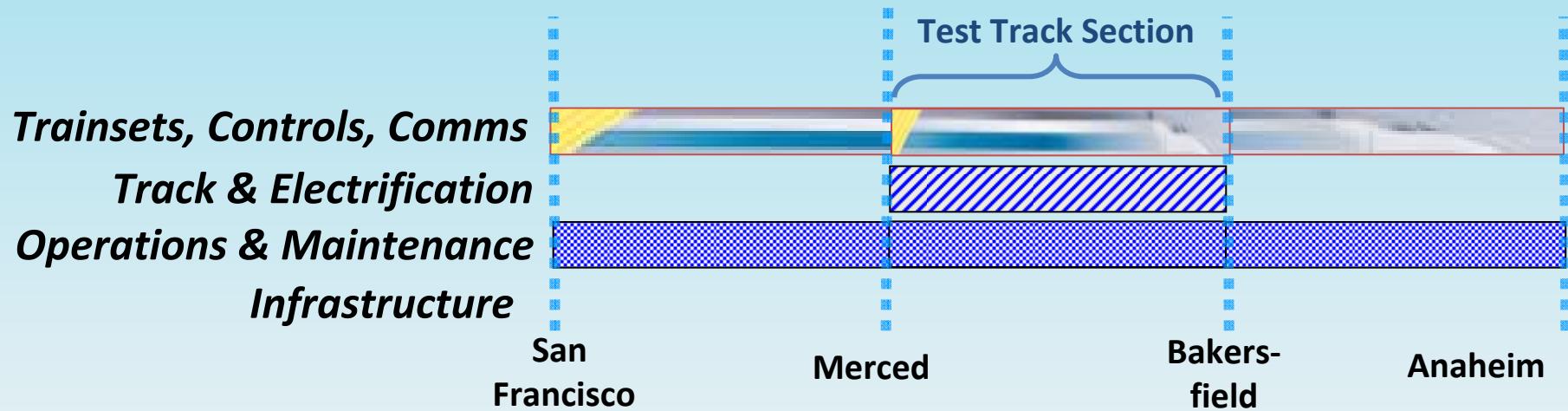


- All core systems to single entity
- Franchise for Operations & Maintenance for 30 – 40 years
- Infrastructure in separate contracts

Steps to Revenue Service

- System Delivery Options

Option 2 –Design/Build/Operate/Maintain/Finance packages

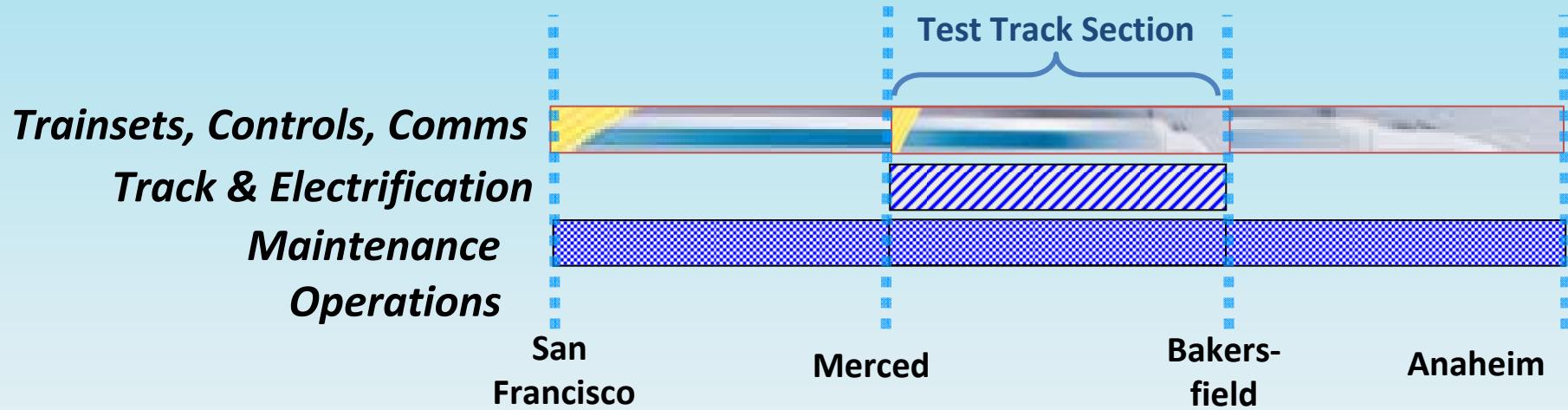


- Single entity for trainsets, controls, communications with franchise for Operations & Maintenance for 30 – 40 years
- Outside of test track, electrification & track in other packages
- Infrastructure in separate contracts

Steps to Revenue Service

- System Delivery Options

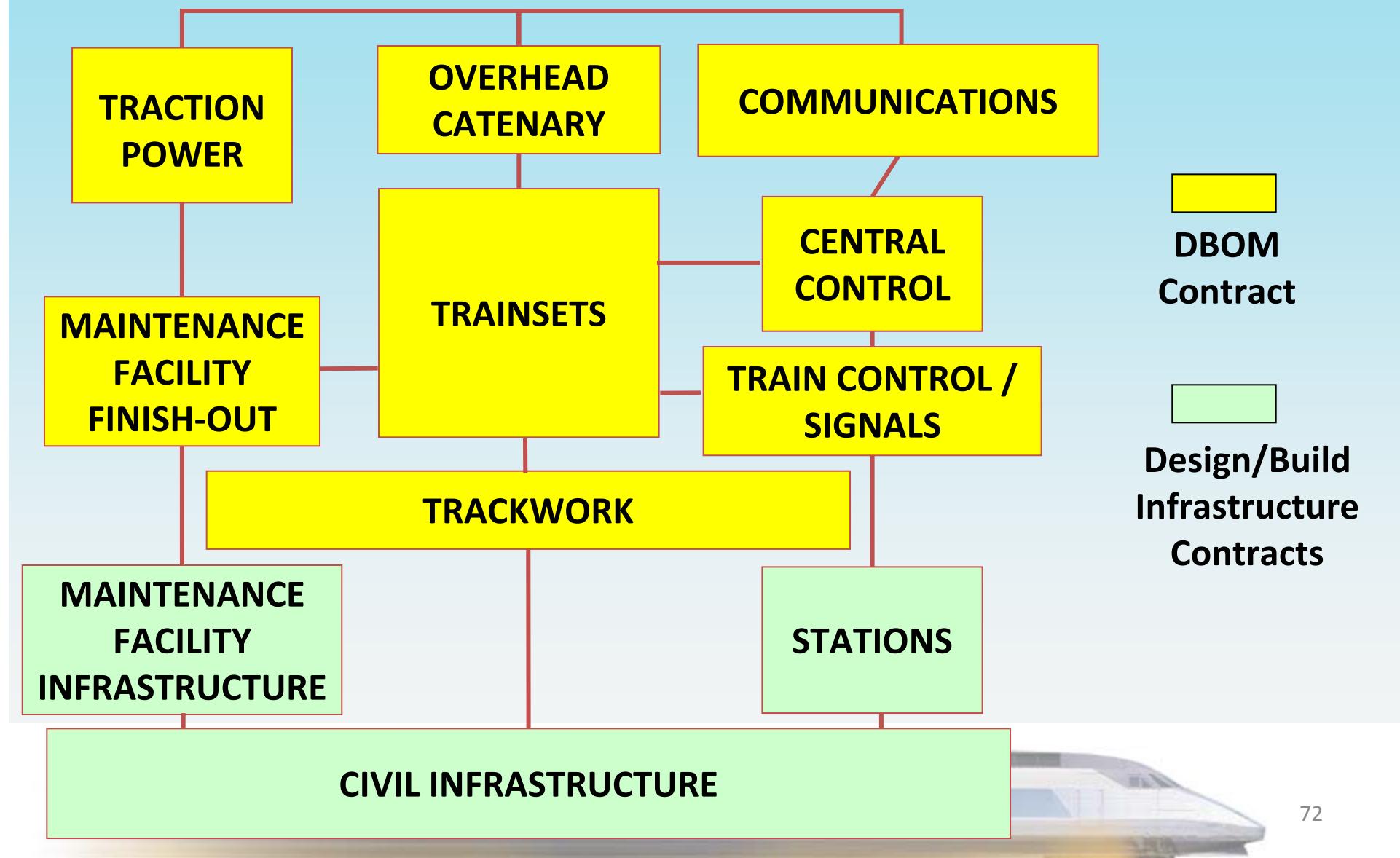
Option 3 – Design/Build/Operate/Maintain/Finance packages



- Single provider of trainsets, controls, communications with responsibility for maintenance
- Operations franchise in separate package
- Outside of test track, electrification & track in separate contracts; infrastructure in separate contracts

Steps to Revenue Service

- Integration of Core Systems & Infrastructure



Steps to Revenue Service

- **Testing, Commissioning, & Revenue Service**

- Approval of Design Safety Case (verification)
 - systematic review & verification of designs, & of construction & installation documentation requirements to be in full compliance with rules & performance standards
- Operations & Maintenance Rules & Procedures developed (verification)
- Hiring and training of managers & key staff to participate in testing & commissioning
- Core systems, infrastructure, & stations tests
 - suppliers & builders, FRA / CPUC / CAHSRA involved
 - individual subsystem tests (static & dynamic)

Steps to Revenue Service

- **Testing, Commissioning, & Revenue Service**

- Test emergency procedures - internal to railway, and with local fire/safety authorities along line
- Trial running of integrated system, starting at lower speeds, and increase in steps to full speeds
- Continue to build up staff to operational levels
- Continued involvement of suppliers & builders, agencies
- Culminates in Operational Safety Case for agency approval - validation
- Start of revenue service upon approvals

Steps to Revenue Service

- **Management of Construction & Installation**

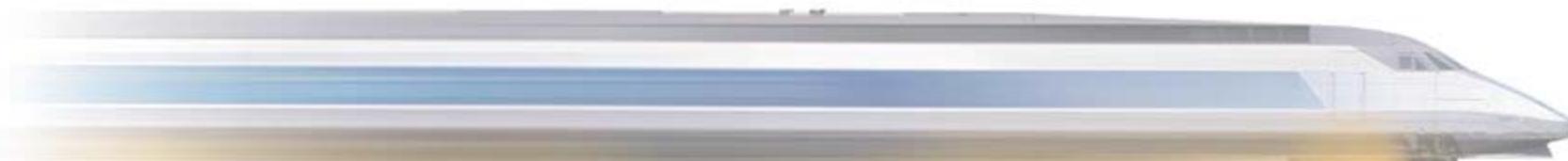
- Contract Compliance – safety, scope, criteria, quality, milestones, testing & commissioning, corrective actions
- Subcontractor and supplier coordination
- Control price, schedule, & delivery
- Community Relations – information to public & stakeholders, maintenance of traffic, outage management
- Interface Management – issue resolution, configurations management, change control
- Timely payments important – streamlined invoice processing



Project Staging Example

- **Anaheim – Los Angeles UPT**

- **Construction Phasing**
 - Utilities & High Tension Power Lines
 - Grade Separation
 - Grading / Earthworks
 - Aerial Structure / Tunnel
 - Track
 - Electrification
 - Train control / Communications
 - Stations



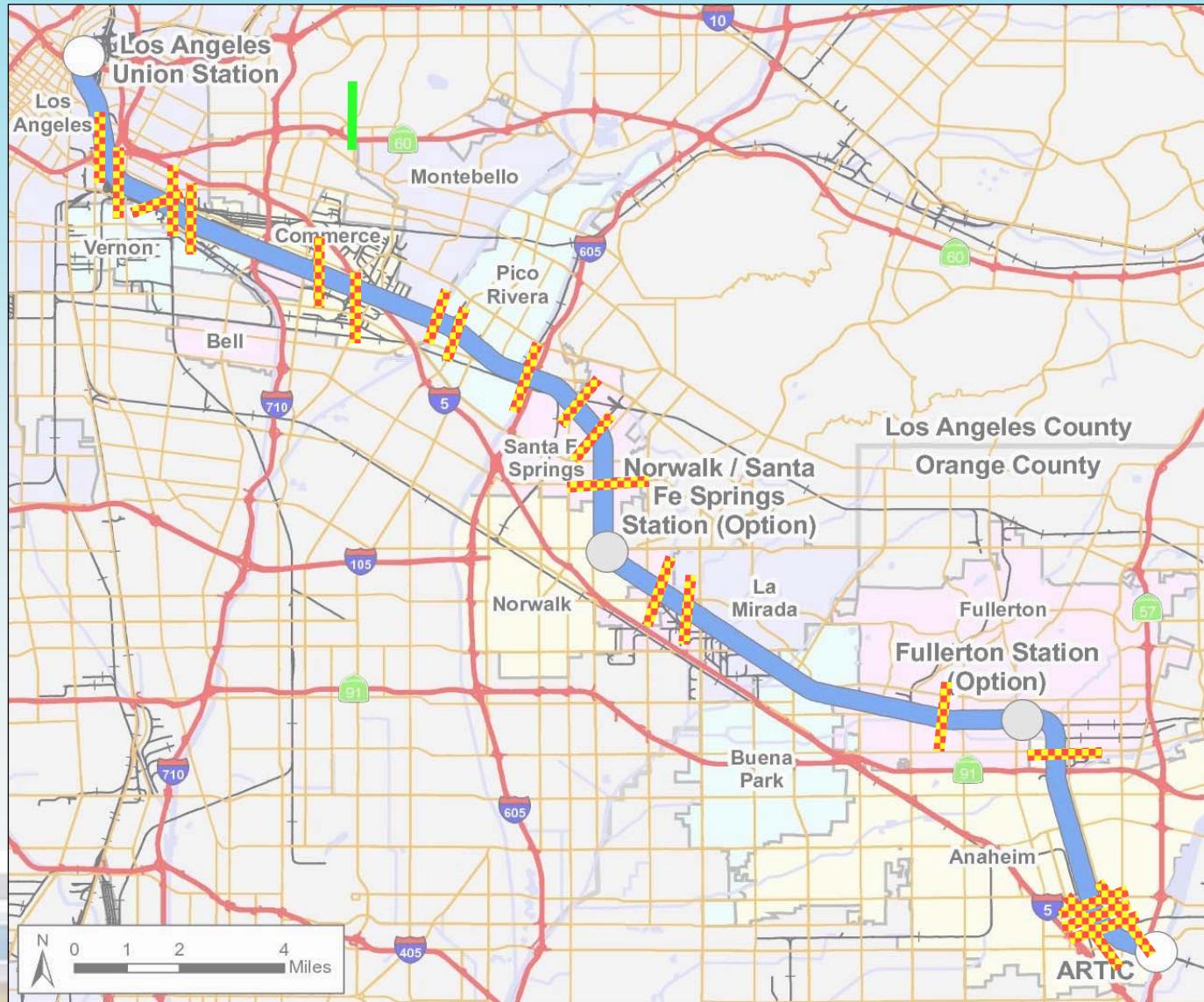
Anaheim - LA Project Staging

- Utility Relocations

- Within BNSF/OCTA ROW
 - MOU with BNSF needed to exercise any prior rights
- Crossing over/under BNSF/OCTA ROW
 - Need MOUs with 14 utility owners
 - Electric, gas, fiber-optic, sewer, water, etc.
 - Some extensive projects e.g. 18 High-Tension Power Lines
 - Start after environmental process complete

Anaheim - LA Project Staging

- High-Tension Power Line Locations



Anaheim - LA Project Staging

- Grade Separation Locations



Anaheim - LA Project Staging

- **Grading / Earthwork**

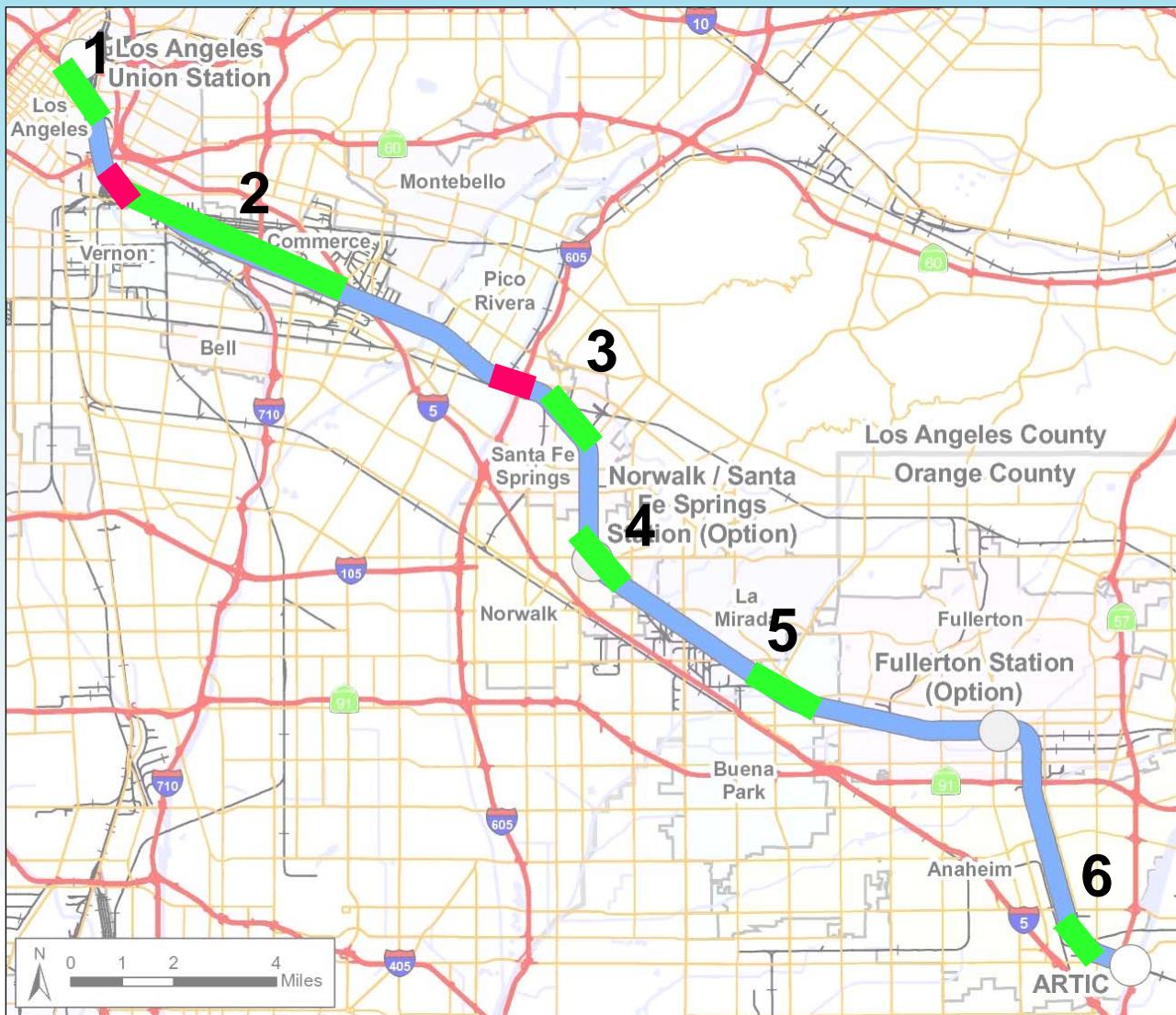
- Started once underground utilities have been relocated and Grade Separations completed
 - Does not include transition structures for viaducts
 - Includes cut, fill, retaining walls, connection to drainage structures, off site mitigation (road relocation, etc.), other facility (sub stations, MOW facility) site preparation.
- Define packages to be within municipal / county boundaries to simplify coordination & compliance with local codes

Anaheim - LA Project Staging

- **Aerial Viaducts / Bridges (9.1 miles)**
 - Break into separate projects
 - 6 viaducts from 0.8 miles to 5.1 miles long
 - LA River Bridge is 1100 feet and at west end of Viaduct #2
 - Slauson Avenue / 605 / UPRR
 - Rebuild Slauson Avenue, cross under 605 and put UPRR in trench
 - Viaduct #2 (5.1 miles) flies over BNSF Hobart Yard with many straddle bents

Anaheim - LA Project Staging

- Long Aerial Viaduct Locations



- Long Aerial Viaducts
- LA River Bridge & Slauson/605 /UPRR Bridge

Anaheim - LA Project Staging

- **Track Construction & Electrification**

- Relocate existing track
 - Accomplish before grading begins on HST roadbed
- Construct new BNSF/Metrolink/ Amtrak track
 - Storage tracks
- Construct HST track along alignment
- One package for relocating and constructing new BNSF / Metrolink / Amtrak track
- One Package for constructing new HST track
- One Package for Electrification

Anaheim - LA Project Staging

- **Stations**

- LA Union Station
- Norwalk/Santa Fe Springs or Fullerton
- ARTIC Phase 2 HSR
- Unknown package size due to potential local consideration of design and desired delivery methods if local funding is used



Anaheim - LA Project Staging

- Potential contract packages

Description	Begin Station	End Station
Construct HST tracks in BNSF ROW	1200	1250
Valley View Grade Separation Partnership	940	942
Utility Relocation within BNSF / OCTA ROW	205	1600
Utility Relocation crossing BNSF / Metro ROW Los Angeles	0	182
Utility Relocation crossing BNSF / Metro ROW Vernon	182	335
Utility Relocation crossing BNSF / Metro ROW Commerce	335	445
Utility Relocation crossing BNSF / Metro ROW Montebello	445	495
Utility Relocation crossing BNSF / Metro ROW Pico Rivera	495	599
Utility Relocation crossing BNSF / Metro ROW Santa Fe Springs	599	938

Anaheim - LA Project Staging

- Potential contract packages

Description	Begin Station	End Station
Utility Relocation crossing BNSF / Metro ROW La Mirada	938	1033
Utility Relocation crossing BNSF / Metro ROW Buena Park	1033	1095
Utility Relocation crossing BNSF / Metro ROW Fullerton	1085	1334
Utility Relocation crossing BNSF / Metro ROW Anaheim	1334	1600
Grade Separations and Off Site Mitigations Commerce	335	445
Grade Separations and Off Site Mitigations Pico Rivera	495	599
Grade Separations and Off Site Mitigations Santa Fe Springs	599	938
Grade Separations and Off Site Mitigations La Mirada	938	1033
Grade Separations and Off Site Mitigations Buena Park	1033	1095

Anaheim - LA Project Staging

- Potential contract packages

Description	Begin Station	End Station
Grade Separations and Off Site Mitigations Fullerton	1085	1334
Grade Separations and Off Site Mitigations Anaheim	1334	1600
Grading / Earthwork	1334	1600
Viaduct #1	0	68
LA River Crossing	130	141
Viaduct #2	141	440
Slauson / 605 / UPRR Separation	585	605
Viaduct #3	938	1033
Viaduct #4	1033	1095

Anaheim - LA Project Staging

- Potential contract packages

Description	Begin Station	End Station
Viaduct #5	1085	1334
Viaduct #6	1334	1600
Tunnel (Alternative)	1334	1600
Track work	0	1600
Traction Power & OCS	130	141
LA Union Station	141	440
Norwalk / Santa Fe Springs Station	760	795
ARTIC Station Platforms	1555	1600
Right of Way Acquisition (preliminary)	0	1600

Anaheim - LA Project Staging

• Contract Packaging Challenges

- Size & number of contracts
 - Early clearing work smaller, up to \$50M; needs strong coordination
 - Line and structures typically large contracts, \$50M - \$2,000M, depending on contractor appetite for risk & bonding
 - Station construction generally independent; tied to community needs
 - Track and electrification packages depend on core system option choice



Summary & Objectives for Next Workshop

- Accomplished today
- Next workshop

